

TITLE:

CUTTING APPARATUS AND METHOD FOR MANUFACTURING CUT ARTICLE

BACKGROUND

5 Technical Field

[0001] The present invention relates to a technology for a cutting apparatus and a method for manufacturing a cut article.

Description of Related Art

[0002] Patent Literature 1 discloses a cutting apparatus which includes a blade replacement
10 mechanism capable of replacing a blade attached to a spindle part. In particular, the blade replacement mechanism described in Patent Literature 1 holds the blade and a flange for fixing the blade, and can be attached to and detached from the spindle part. The blade replacement mechanism allows automatic blade replacement.

Related Art

15 Patent Literature

[0003] Patent Literature 1: Japanese Patent Application Laid-Open No. 2019-5857

SUMMARY

Technical Problem

20 **[0004]** Here, in the cutting apparatus as described in Patent Literature 1, since cutting debris and water droplets generated during cutting may be attached to the flange, it is favorable to perform a washing operation on the flange as appropriate. Therefore, from the viewpoint of reducing the workload, there is a need for technology capable of automatically washing flanges.

[0005] The present invention has been made in view of the above circumstances, and an object
25 thereof is to provide a cutting apparatus and a method for manufacturing a cut article that are capable of washing flanges.

Solution to the Problem

[0006] The problem to be solved by the present invention is as described above, and in order to solve the problem, a cutting apparatus according to the present invention includes a blade replacement mechanism for replacing a blade provided on a spindle part, and a washing mechanism which washes a pair of flanges for fixing the blade to the spindle part.

[0007] Further, a method for manufacturing a cut article according to the present invention includes a step of replacing the blade provided on the spindle part using the cutting apparatus, a step of washing the pair of flanges, and a step of cutting an object to be cut with the blade.

Effects

[0008] According to the present invention, the flange can be washed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is a schematic plan view showing the overall configuration of a cutting apparatus according to an embodiment.

FIG. 2 is a perspective view showing the positional relationship among the blade replacement mechanism, the washing mechanism, and the spindle part.

FIG. 3 is a perspective view showing the operation of the moving part.

FIG. 4 is an enlarged cross-sectional perspective view showing the configuration of the spindle part.

(a) of FIG. 5 is a perspective view showing the shape of the first washing sponge. (b) of FIG. 5 is a perspective view showing a modified example of the first washing sponge.

(a) of FIG. 6 is a schematic diagram showing how a blade is washed with air from an air nozzle.

(b) of FIG. 6 is a schematic diagram showing how the second flange and the blade are removed

from the spindle. (c) of FIG. 6 is a schematic diagram showing how used blades are stored. (d)

of FIG. 6 is a schematic diagram showing how the second flange is washed with the second

washing sponge.

(a) of FIG. 7 is a schematic diagram showing how the holding part holds an unused blade. (b) of FIG. 7 is a schematic diagram showing how the first flange is washed with air from an air nozzle.

(c) of FIG. 7 is a schematic diagram showing how the first flange is washed with the first washing

5 sponge. (d) of FIG. 7 is a schematic diagram showing how the second flange and the blade are attached to the spindle.

DESCRIPTION OF THE EMBODIMENTS

[0010] <Configuration of cutting apparatus 1>

10 First, the configuration of a cutting apparatus 1 according to an embodiment will be described. In the embodiment, for example, as an object to be cut by the cutting apparatus 1, the configuration of the cutting apparatus 1 will be described when using a sealed substrate W in which a substrate on which a semiconductor chip is mounted is sealed with resin.

[0011] As the sealed substrate W, for example, a ball grid array (BGA) package substrate, a chip size package (CSP) package substrate, a light emitting diode (LED) package substrate, etc. are used. Furthermore, as the object to be cut, not only the sealed substrate W but also a sealed lead frame in which a lead frame on which a semiconductor chip is mounted is sealed with resin may be used.

[0012] The cutting apparatus 1 shown in FIG. 1 is a machining device that separates the sealed substrate W, which is the object to be cut, into multiple cut articles (products P). The cutting apparatus 1 includes a substrate supply module A, a cutting module B, and a storage module C as components. Each of the components is removable and replaceable with respect to other components.

[0013] <Substrate supply module A>

25 The substrate supply module A is mainly provided with a substrate supply mechanism 11 and a control part CTL.

[0014] The sealed substrate W, which is the object to be cut, is carried out from the substrate supply mechanism 11 and transferred to the cutting module B by a transfer mechanism (not shown). The control part CTL controls the operation of each of parts of the cutting apparatus 1. By controlling each of the parts of the cutting apparatus 1 by the control part CTL, the sealed substrate W may be carried in, the sealed substrate W may be cut, the product P may be tested, the product P may be carried out, etc. Note that the control part CTL may also be provided in a module other than the substrate supply module A. Further, the control part CTL may be divided into multiple parts. For example, the control part CTL may be provided in each of the modules and each of the parts may be controlled by linking the control parts CTL with each other.

[0015] <Cutting module B>

The cutting module B shown in FIG. 1 is mainly provided with a cutting table 21, a cutting jig 22, a moving mechanism 23, a rotating mechanism 24, a spindle part 25, a partition wall 26, a blade replacement table 27, a blade replacement mechanism 100, a closing part 200, a first washing mechanism 310 (a washing mechanism 300), and a second washing mechanism 320 (the washing mechanism 300).

[0016] In the embodiment, a twin cut table type cutting apparatus 1 having two cutting tables 21 is illustrated. The cutting jig 22 is provided on the cutting table 21. The cutting table 21 is movable in a Y direction by the moving mechanism 23 and rotatable in a θ direction by the rotating mechanism 24.

[0017] Further, in the embodiment, the cutting apparatus 1 having a twin spindle configuration which has two spindle parts 25 is illustrated. The two spindle parts 25 are movable in an X direction and a Z direction independently of each other.

[0018] The partition wall 26 is provided at an appropriate position to partition a space in which the spindle part 25 is disposed and a space in which the blade replacement table 27 is disposed.

In the embodiment, the partition wall 26 is disposed behind one of the spindle parts 25 (on the right side in the figure). Furthermore, the partition wall 26 is disposed to surround the blade

replacement table 27. An opening 26a is formed in a portion of the partition wall 26 to connect the space in which the spindle part 25 is disposed and the space in which the blade replacement table 27 is disposed.

[0019] On the upper surface of the blade replacement table 27 shown in FIGS. 1 and 2, a used blade storage part 27a in which a blade 25a which has been used in the spindle part 25 is stored and an unused blade storage part 27b in which the blade 25a which is unused and for replacement is stored are provided. The used blade storage part 27a is formed into a box shape with an open top surface. Further, the second washing mechanism 320 (the washing mechanism 300), which will be described later, is provided on the upper surface of the blade replacement table 27.

[0020] Note that the configurations of the unused blade storage part 27b and the used blade storage part 27a are not limited to the embodiment, and may be arbitrarily changed. As an example, the used blade storage part 27a may also be configured to include a cylindrical member extending up and down. In such a configuration, the blade 25a may be held by inserting the center of the blade 25a into the cylindrical member.

[0021] The blade replacement mechanism 100 is for replacing the blade 25a provided on the spindle part 25. The blade replacement mechanism 100 is disposed behind the two spindle parts 25 (on the right side in the figure). The blade replacement mechanism 100 is provided with a closing part 200 that may close the opening 26a of the partition wall 26. The blade replacement mechanism 100 is further provided with the first washing mechanism 310 (the washing mechanism 300), which will be described later.

[0022] In the cutting module B, by relatively moving the cutting table 21 and the two spindle parts 25 while the sealed substrate W is held on the cutting table 21, the sealed substrate W can be cut into individual pieces. The blade 25a of the spindle part 25 cuts the sealed substrate W held on the cutting table 21 by rotating in a plane including the Y direction and the Z direction. At this time, the sealed substrate W can also be cut while spraying cutting water toward the blade 25a.

[0023] <Storage module C>

The storage module C is mainly provided with an inspection table 31 and a tray 32.

[0024] On the inspection table 31, an assembly consisting of multiple individual products P obtained by cutting the sealed substrate W is placed. The products P are tested by an inspection camera (not shown) and sorted into non-defective products and defective products. The selected non-defective products are stored in the tray 32. The selected defective products are stored in a separately prepared tray (not shown) and excluded from the products P. Note that testing the products P does not have to be needed in the storage module C.

[0025] <Detailed configuration of blade replacement mechanism 100 etc.>

Next, the configurations of the blade replacement mechanism 100, the closing part 200, and the washing mechanism 300 will be described in more detail. Note that the detailed structure, shape, etc. of each of parts of the blade replacement mechanism 100 etc. are not particularly limited, and therefore, in the embodiment, the shape etc. of each of the parts are appropriately simplified and illustrated.

[0026] <Blade replacement mechanism 100>

As shown in FIGS. 2 and 3, the blade replacement mechanism 100 mainly includes a support part 110, a holding part 120, and a moving part 130.

[0027] The support part 110 supports the holding part 120 and the first washing mechanism 310, which will be described later. The support part 110 can be formed by combining appropriate members (rod-like members, plate-like members, etc.). In the embodiment, the support part 110 is formed into a long longitudinal shape extending in one of the directions (the X direction in FIGS. 2 and 3).

[0028] The holding part 120 may hold the blade 25a provided on the spindle part 25 and a second flange 25d for fixing the blade 25a to the spindle part 25. The holding part 120 is provided at one end of the support part 110 in a longitudinal direction.

[0029] Here, the configuration of the spindle part 25 (especially the portion related to fixing the

blade 25a) will be described using FIG. 4. FIG. 4 shows a partial cross section of one of the two spindle parts 25 (the spindle part 25 on the left side of the paper in FIG. 2).

[0030] A first flange 25c in a substantially annular shape is fixed to a rotating shaft 25b of the spindle part 25. Furthermore, the second flange 25d in a substantially annular shape is provided to face the first flange 25c. Note that the first flange 25c and the second flange 25d are an embodiment of one of flanges and the other of the flanges according to the present invention, respectively.

[0031] By tightening a detachable member 25e such as a nut to the boss portion of the first flange 25c, the second flange 25d is pressed toward the first flange 25c. A first contact surface 25f and a second contact surface 25g that protrude in directions facing each other are formed on the outer peripheral portions of the first flange 25c and the second flange 25d. The blade 25a in a substantially annular shape is sandwiched and fixed between the first contact surface 25f and the second contact surface 25g.

[0032] The holding part 120 shown in FIGS. 2 and 3 rotates the detachable member 25e attached to the spindle part 25, and the detachable member 25e can be attached to and detached from the boss portion of the first flange 25c. Further, the holding part 120 can independently hold the blade 25a and the second flange 25d. The method for the holding part 120 to hold the blade 25a and the second flange 25d is as follows: examples include a method in which the blade 25a or the like is held by suction, or a method in which a claw-like member is hooked onto the blade 25a or the like to mechanically hold the blade 25a or the like.

[0033] In this way, the holding part 120 can remove the blade 25a and the second flange 25d attached to the spindle part 25 from the spindle part 25. Further, the holding part 120 can attach the blade 25a and the second flange 25d that are being held to the spindle part 25.

[0034] The moving part 130 moves the support part 110 in any direction. The moving part 130 mainly includes a rotating part 131, a first linear moving part 132, a second linear moving part 133, and a third linear moving part 134.

[0035] The rotating part 131 rotates the support part 110. The rotating part 131 supports the support part 110 and can rotate the support part 110 using the driving force of a drive source such as a motor. The rotating part 131 can rotate the support part 110 around an axis parallel to the Y direction.

5 **[0036]** The first linear moving part 132 linearly moves the rotating part 131. The first linear moving part 132 supports the rotating part 131 and can move the rotating part 131 using the driving force of a drive source such as a motor. The first linear moving part 132 can linearly move the rotating part 131 along the Y direction.

[0037] The second linear moving part 133 linearly moves the first linear moving part 132. The
10 second linear moving part 133 supports the first linear moving part 132 and can move the first linear moving part 132 using the driving force of a drive source such as a motor. The second linear moving part 133 can linearly move the first linear moving part 132 along the Z direction.

[0038] The third linear moving part 134 shown in FIG. 2 linearly moves the second linear moving part 133. The third linear moving part 134 supports the second linear moving part 133
15 and can move the second linear moving part 133 using the driving force of a drive source such as a motor. The third linear moving part 134 can linearly move the second linear moving part 133 along the X direction.

[0039] By combining the movements of each of the parts of the moving part 130 configured as described above, the support part 110 can be moved to an arbitrary position, and can be rotated
20 arbitrarily around an axis along the Y direction.

[0040] <Closing part 200>

The closing part 200 is capable of closing the opening 26a of the partition wall 26. The closing part 200 is formed into a plate shape having a shape corresponding to the opening 26a. The closing part 200 is disposed on one side of the support part 110 (on the right side of the paper
25 in FIG. 2) in the X direction. The closing part 200 is provided in the moving part 130 with the plate surface facing in the X direction. Specifically, the closing part 200 is provided in the second

linear moving part 133 and can be moved linearly in the X direction by the third linear moving part 134.

[0041] <Washing mechanism 300>

The washing mechanism 300 is for washing the flanges (the first flange 25c and the second flange 25d) for fixing the blade 25a to the spindle part 25. The washing mechanism 300 mainly includes the first washing mechanism 310 and the second washing mechanism 320.

[0042] The first washing mechanism 310 shown in FIG. 3 washes the first flange 25c attached to the spindle part 25. The first washing mechanism 310 mainly includes a first washing sponge 311 and an air nozzle 312.

[0043] The first washing sponge 311 shown in FIG. 3 and (a) of FIG. 5 is a washing member for washing the first flange 25c. The first washing sponge 311 is formed into a cylindrical shape having the same outer diameter as the first flange 25c. The first washing sponge 311 is attached to one end in the longitudinal direction of the support part 110 via an attachment member 311a in a disk shape. The first washing sponge 311 is provided on the side opposite to the holding part 120 in the longitudinal direction of the support part 110. In other words, the first washing sponge 311 is provided at a position reversed by 180 degrees from the holding part 120 with the rotation axis of the rotating part 131 as the center. In addition, in the embodiment, the “side opposite to the holding part 120” on which the first washing sponge 311 is disposed is an example of the “side different from the holding part” according to the present invention.

[0044] Note that the first washing sponge 311 is not limited to the cylindrical shape shown in (a) of FIG. 5, but can have any shape. For example, as in a modified example shown in (b) of FIG. 5, the cylinder may be divided into multiple parts. As a result, the first flange 25c can be washed using the corners of the sponge, and the washing capability of the first washing sponge 311 can be improved.

[0045] The air nozzle 312 shown in FIG. 3 can blow out compressed air supplied from a compressor (not shown). The air nozzle 312 is provided at one end of the support part 110 in the

longitudinal direction (on the same side as the first washing sponge 311). The air nozzle 312 is disposed with the air blowing direction directed toward the side of the first washing sponge 311.

[0046] The second washing mechanism 320 washes the second flange 25d that has been removed from the spindle part 25 (held by the holding part 120). The second washing
5 mechanism 320 mainly includes a second washing sponge 321 and a drive part 322.

[0047] The second washing sponge 321 shown in FIG. 2 is a washing member for washing the second flange 25d. The second washing sponge 321 is formed into a cylindrical shape having the same diameter as the second flange 25d. The second washing sponge 321 is formed in the same shape as the first washing sponge 311 shown in FIG. 5. The second washing sponge 321
10 is provided on the upper surface of the blade replacement table 27 with the cylindrical axis oriented in the Z direction.

[0048] The drive part 322 rotates the second washing sponge 321. The drive part 322 has a drive source such as a motor, for example. The output shaft of the drive part 322 is connected to the second washing sponge 321. The driving force of the drive part 322 allows the second
15 washing sponge 321 to be rotated around an axis parallel to the Z direction.

[0049] <Operation of blade replacement mechanism 100 etc.>

Next, the operations of the blade replacement mechanism 100 and the washing mechanism 300 configured as described above for replacing the blade 25a provided on the spindle part 25 and washing the first flange 25c and the second flange 25d will be described. In addition, below,
20 among the two spindle parts 25, a case will be described in which the blade 25a of one of the spindle parts 25 (for example, the spindle part 25 on the left side of the paper in FIG. 2) is replaced.

[0050] When the sealed substrate W is being cut by the cutting apparatus 1, the closing part 200 waits at a position where the closing part 200 closes the opening 26a of the partition wall 26, as shown by the two-dot chain line in FIG. 2. In this way, by closing the opening 26a with the
25 closing part 200, the space in which the blade replacement table 27 is disposed and the space in which the spindle part 25 is disposed can be partitioned. As a result, cutting debris and water

droplets generated when cutting the sealed substrate W may be prevented from being attached to the blade replacement table 27 (particularly the unused blade storage part 27b in which the blade 25a for replacement is stored). Note that in the state, the holding part 120 and the first washing mechanism 310 are located in the space in which the blade replacement table 27 is disposed.

5 **[0051]** When replacing the blade 25a or the like, the cutting of the sealed substrate W by the cutting apparatus 1 is temporarily suspended. Note that the replacement of the blade 25a and the washing of the first flange 25c and the second flange 25d can be performed at any timing. For example, the amount of wear on the blade 25a can be detected by an appropriate sensor, and the blade 25a can be replaced when the amount of wear exceeds a certain amount. Further, the blade
10 25a can be replaced at a timing when the operating time of the cutting apparatus 1, the number of products P produced, etc. exceed a predetermined value.

[0052] When replacing the blade 25a, etc., the moving part 130 moves the closing part 200 integrally with the support part 110 and the holding part 120, and the opening 26a of the partition wall 26 is opened. The support part 110 and the like can move between the space on the side of
15 the spindle part 25 and the space on the side of the blade replacement table 27 via the opening 26a opened.

[0053] When replacing the blade 25a, first, as shown in (a) of FIG. 6, the support part 110 is moved by the moving part 130, the tip of the air nozzle 312 is directed toward the blade 25a attached to the spindle part 25. In the state, air is blown out from the air nozzle 312 to remove
20 cutting debris and water droplets attached to the blade 25a.

[0054] Note that cutting debris and water droplets that cannot be removed by the air nozzle 312 remain on the blade 25a. Then, as will be described later, when removing the second flange 25d and the blade 25a from the spindle part 25, cutting debris and water droplets remaining on the blade 25a may be attached to and contaminate the first flange 25c and the second flange 25d.

25 **[0055]** Next, as shown in (b) of FIG. 6, the moving part 130 reverses the support part 110, and moves the holding part 120 to a position facing the blade 25a of the spindle part 25. Then, the

second flange 25d and the blade 25a are removed from the spindle part 25 by the holding part 120.

[0056] Next, as shown in (c) of FIG. 6, the moving part 130 moves the holding part 120 to a position facing the used blade storage part 27a provided on the blade replacement table 27 from above. Then, the holding part 120 releases the blade 25a, and the blade 25a used is stored in the
5 used blade storage part 27a.

[0057] Next, as shown in (d) of FIG. 6, the moving part 130 moves the second flange 25d held by the holding part 120 to a position where the second flange 25d contacts the upper surface of the second washing sponge 321 of the second washing mechanism 320. In the state, the drive part 322 rotates the second washing sponge 321, thereby washing the surface of the second flange
10 25d (particularly the second contact surface 25g shown in FIG. 4). In this way, cutting debris and the like attached to the second flange 25d can be removed.

[0058] Next, as shown in (a) of FIG. 7, the moving part 130 moves the holding part 120 to a position facing the unused blade storage part 27b provided on the blade replacement table 27 from above. The blade 25a that is unused stored in the unused blade storage part 27b is held by the
15 holding part 120. As in the embodiment, by providing the used blade storage part 27a, the unused blade storage part 27b, and the second washing mechanism 320 on the same blade replacement table 27, the moving distance when the holding part 120 moves between the used blade storage part 27a, the unused blade storage part 27b, and the second washing mechanism 320 can be kept short.

[0059] Next, as shown in (b) of FIG. 7, the moving part 130 moves the support part 110, and the tip of the air nozzle 312 is directed toward the first flange 25c attached to the spindle part 25. In the state, air is blown out from the air nozzle 312, and cutting debris and water droplets attached to the first flange 25c are removed.

[0060] Next, as shown in (c) of FIG. 7, the moving part 130 moves the first washing sponge 311
25 of the first washing mechanism 310 to a position where the first washing sponge 311 contacts the first flange 25c attached to the spindle part 25. In the state, the spindle part 25 rotates to wash

the surface of the first flange 25c (particularly the first contact surface 25f shown in FIG. 4). In this way, cutting debris and the like attached to the first flange 25c can be removed.

[0061] Next, as shown in (d) of FIG. 7, the moving part 130 reverses the support part 110, and moves the holding part 120 to a position facing the first flange 25c of the spindle part 25. Then, the second flange 25d and the blade 25a held by the holding part 120 are attached to the spindle part 25.

[0062] In addition, in the above example, the operation of replacing the blade 25a of one of the spindle parts 25 has been explained, the operation of replacing the blade 25a of the other of the spindle parts 25 is generally the same, so a description thereof will be omitted.

[0063] As mentioned above, when the replacement of the blade 25a of the spindle part 25 and the washing of the first flange 25c and the second flange 25d are completed, the closing part 200 moves again to the position where the closing part 200 closes the opening 26a of the partition wall 26 (see FIG. 2). Thereafter, the cutting of the sealed substrate W by the cutting apparatus 1 is resumed.

[0064] In this way, in the embodiment, the step of replacing the blade 25a provided on the spindle part 25 and the step of washing the first flange 25c and the second flange 25d can be performed in parallel. Furthermore, the step of cutting the sealed substrate W with the blade 25a replaced can be performed.

[0065] As described above, the cutting apparatus 1 according to the embodiment includes the blade replacement mechanism 100 which replaces the blade 25a provided on the spindle part 25, and the washing mechanism 300 which washes the pair of flanges (the first flange 25c and the second flange 25d) for fixing the blade 25a to the spindle part 25.

With this configuration, the flange can be washed. Further, by washing the flange using the washing mechanism 300, the burden of washing work on a user may be reduced. Further, by washing the flange, the blade 25a can be properly fixed.

[0066] The washing mechanism 300 further includes the first washing mechanism 310 which

washes the first flange 25c (one of the flanges) of the pair of flanges, and a second washing mechanism 320 which washes the second flange 25d (the other of the flanges) of the pair of flanges.

With this configuration, the pair of flanges can be washed more effectively by washing the pair of flanges individually.

5 **[0067]** Further, the first washing mechanism 310 is capable of washing the first flange 25c attached to the spindle part 25, and the second washing mechanism 320 is capable of washing the second flange 25d that is removed from the spindle part 25.

With this configuration, the second flange 25d that is removed from the spindle part 25 when replacing the blade 25a and the first flanges 25c remaining on the spindle part 25 can be washed
10 respectively.

[0068] In addition, the first washing mechanism 310 is capable of washing the first flange 25c in a state where the first flange 25c attached to the spindle part 25 is rotated by the rotation of the spindle part 25.

With this configuration, the first flange 25c can be washed using the rotation of the spindle
15 part 25. In this way, the structure of the first washing mechanism 310 can be simplified.

[0069] Further, the blade replacement mechanism 100 includes the holding part 120 capable of holding the blade 25a and the second flange 25d, the support part 110 which supports the holding part 120 and the first washing mechanism 310, and the moving part 130 capable of moving the support part 110, and the first washing mechanism 310 is provided on a side of the support part
20 110 that is different from the holding part 120.

With this configuration, by providing the first washing mechanism 310 and the holding part 120 on different sides, the center of gravity of the support part 110 may be suppressed from being biased. In this way, the support part 110 can be moved smoothly. In particular, in the embodiment, since the first washing mechanism 310 and the holding part 120 are provided on
25 opposite sides, the center of gravity of the support part 110 may be effectively prevented from shifting.

[0070] Furthermore, the second washing mechanism 320 is capable of washing the second flange 25d held by the holding part 120.

With this configuration, when replacing the blade 25a, the second flange 25d held by the holding part 120 can be washed as is, so the second flange 25d can be efficiently washed.

5 **[0071]** Further, the cutting apparatus 1 includes the partition wall 26 which partitions the space in which the spindle part 25 is disposed and the space in which the blade 25a for replacement is disposed and has the opening 26a, and includes the closing part 200 that is movable by the moving part 130 and closes the opening 26a when the blade replacement mechanism 100 is in a predetermined position.

10 With this configuration, the holding part 120 and the like can be moved through the opening 26a, and the opening 26a can be closed by the closing part 200 if needed. For example, by closing the opening 26a with the closing part 200 during the cutting of the sealed substrate W, cutting debris and the like may be prevented from being attached to the blade 25a for replacement. In particular, in the embodiment, in a state where the closing part 200 closes the opening 26a, since
15 the holding part 120 and the first washing mechanism 310 are disposed in the space on the side of the blade 25a for replacement, cutting debris generated during cutting of the sealed substrate W may be prevented from being attached to the holding part 120 and the like.

[0072] Further, the method for manufacturing the product P (cut article) according to the embodiment includes a step of replacing the blade 25a provided on the spindle part 25 using the
20 cutting apparatus 1, a step of washing the pair of flanges, and a step of cutting the sealed substrate W (object to be cut) with the blade 25a.

With this configuration, the flange can be washed. In particular, in the embodiment, the step of replacing the blade 25a and the step of washing the pair of flanges can be performed in parallel, so the product P can be manufactured efficiently.

25 **[0073]** Although the embodiment of the present invention has been described above, the present invention is not limited to the above embodiment, appropriate changes can be made within the

scope of the technical idea of the invention described in the claims.

[0074] For example, the configuration of the moving part 130 of the embodiment (see FIG. 3, etc.) is an example, and the specific configuration is not limited as long as the moving part 130 can move the holding part 120 and the first washing mechanism 310 to the required positions.

5 Further, although the closing part 200 is provided in the second linear moving part 133, the present invention is not limited thereto. That is, the closing part 200 may have any configuration as long as the closing part 200 can be moved by the moving part 130 to close the opening 26a, for example, the third linear moving part 134 may be configured to be provided independently of the second linear moving part 133.

10 **[0075]** Further, in the embodiment, when washing the first flange 25c, although an example has been shown in which the spindle part 25 is rotated (see (c) of FIG. 7), a configuration may be adopted in which, for example, the first washing sponge 311 is rotated.

[0076] Further, the shapes of the first washing sponge 311 and the second washing sponge 321 are not limited to the shapes of the embodiment (see FIG. 5), and can be arbitrarily changed.

15 **[0077]** Further, the washing mechanism 300 according to the embodiment performs washing using sponges (the first washing sponge 311 and the second washing sponge 321) as washing members, but the present invention is not limited thereto, and any washing member (for example, a rag, etc.) may be used.

[0078] Further, the washing mechanism 300 according to the embodiment washes the flange
20 using the sponge and the air nozzle 312, but the method for washing the flange is not limited thereto, and the flange may be washed by any washing method. For example, the flange may be washed by spraying washing water onto the flange, or the flange may be washed by sucking cutting debris and the like attached to the flange. Further, the washing mechanism 300 may further wash the flange by combining multiple washing methods.

25 **[0079]** Further, in the embodiment, an example has been shown in which the first flange 25c is washed with the first flange 25c attached to the spindle part 25 (see (b) and (c) of FIG. 7), but the

present invention is not limited thereto. For example, the first flange 25c may also be configured to be washed while the first flange 25c is removed from the spindle part 25. In this case, a separate mechanism for attaching and detaching the first flange 25c may also be provided to automatically attach and detach the first flange 25c.

5 [0080] Further, in the embodiment, an example has been shown in which the holding part 120 and the first washing mechanism 310 are provided on the opposite side of the support part 110 (a position reversed by 180 degrees when viewed from the front, see FIG. 6 etc.), but the present invention is not limited thereto, and the holding part 120 and the first washing mechanism 310 may be provided at any position on the support part 110. For example, the first washing
10 mechanism 310 may also be disposed at a position rotated by 90 degrees or 120 degrees with respect to the holding part 120.

[0081] Further, in the embodiment, an example has been shown in which both the holding part 120 and the first washing mechanism 310 are provided on the support part 110 and moved integrally, but the present invention is not limited thereto. For example, a configuration may also
15 be adopted in which the holding part 120 and the first washing mechanism 310 are provided in separate members and moved independently of each other.

[0082] Further, in the embodiment, although an example has been shown in which the cutting of the sealed substrate W by the cutting apparatus 1 is temporarily suspended, the blade 25a is replaced, and the flange is washed, the timing for replacing the blade 25a, etc. can be arbitrarily
20 determined. For example, replacement of the spindle part 25 may also be performed before the cutting apparatus 1 starts cutting the sealed substrate W or after the cutting of the sealed substrate W by the cutting apparatus 1 is completed. Moreover, when the cutting apparatus 1 is provided with multiple spindle parts 25 as in the embodiment, the blades 25a of the respective spindle parts 25 can also be replaced at the same timing or at different timings.'

25 Description of Reference Numerals

[0083]

- 1: cutting apparatus
- 25: spindle
- 25a: blade
- 25c: first flange
- 5 25d: second flange
- 26: partition wall
- 26a: opening
- 100: blade replacement mechanism
- 110: support part
- 10 120: holding part
- 130: moving part
- 200: closing part
- 300: washing mechanism
- 310: first washing mechanism
- 15 320: second washing mechanism

CLAIMS

[Claim 1]

A cutting apparatus, comprising:

a blade replacement mechanism, replacing a blade provided on a spindle part; and

5 a washing mechanism, washing a pair of flanges for fixing the blade to the spindle part.

[Claim 2]

The cutting apparatus according to claim 1, wherein

the washing mechanism comprises

a first washing mechanism which washes one of the pair of flanges and

10 a second washing mechanism which washes the other of the pair of flanges.

[Claim 3]

The cutting apparatus according to claim 2, wherein

the first washing mechanism is capable of washing the one of the flanges attached to the spindle part, and

15 the second washing mechanism is capable of washing the other of the flanges that is removed from the spindle part.

[Claim 4]

The cutting apparatus according to claim 2 or 3, wherein the first washing mechanism is capable of washing the one of the flanges while the one of the flanges attached to the spindle part
20 is rotated by rotation of the spindle part.

[Claim 5]

The cutting apparatus according to claim 3 or 4, wherein

the blade replacement mechanism comprises

a holding part capable of holding the blade and the other of the flanges,

25 a support part which supports the holding part and the first washing mechanism, and

a moving part capable of moving the support part, and

the first washing mechanism is provided on a side of the support part that is different from the holding part.

[Claim 6]

5 The cutting apparatus according to claim 5, wherein the second washing mechanism is capable of washing the other of the flanges held by the holding part.

[Claim 7]

The cutting apparatus according to claim 5 or 6, comprising:

a partition wall, partitioning a space in which the spindle part is disposed and a space in which a blade for replacement is disposed, and having an opening; and

10 a closing part, movable by the moving part and closing the opening when the blade replacement mechanism is in a predetermined position.

[Claim 8]

A method for manufacturing a cut article, comprising: replacing the blade provided on the spindle part using the cutting apparatus according to any one of claims 1 to 7; washing the pair of
15 flanges; and cutting an object to be cut with the blade.